Check List 8(2): 224-236, 2012
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ISSN 1809-127X (available at *www.checklist.org.br*)

Check List
Journal of species lists and distribution

LISTS OF SPECIES

Floristic composition of a Subtropical bog, Eastern Plateau from southern Brazil

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ABSTRACT: This is a comprehensive list of plants and fungi from a bog in the Southern Brazilian Plateau, which may be used as a reference for subtropical marsh flora investigations. The very well preserved bog named Banhado Amarelo (29°19' S, 50°08' W) is located on the eastern Plateau of Rio Grande do Sul, the southernmost state of Brazil. A total of 262 specific and infra-specific taxa were listed, including six macroscopic fungi, 10 lichens, 21 mat forming algae, 57 bryophytes, 12 pteridophytes, two gymnosperms and 154 angiosperms. For every taxon the mode of occurrence in the bog was indicated. The frequency of distinct taxonomic groups among themselves was determined and a general description of the flora of the main bog environments is presented. The number of taxa found in the bog was compared to those obtained in other surveys of bogs of the eastern Plateau from Rio Grande do Sul.

INTRODUCTION

High altitude grasslands, with a mosaic of *Araucaria* forests and bogs, characterize the landscape physiognomy of the higher portions of the easternmost Southern Brazilian Plateau in Rio Grande do Sul state (Planalto das Araucárias, IBGE 1986). The great difference in altitude (about 1000 m) between the eastern highlands, which end abruptly, and the adjacent Coastal Plain leads to a rise of warm and humid air masses on the edge of the Plateau that results in fog formation (Nimer 1989). The total rainfall is between 1750 and 2500 mm per year (IBGE 1986), with an annual mean of 2252 mm (Backes *et al*. 2000), the highest rainfall in Southern Brazil (Nimer 1989). There is no defined dry season, and both the maximum and minimum monthly rainfalls may occur at any time of the year. However, periods with low levels of rainfall are possible (Rambo 1956). The oceanic humidity spreads inward with gradual reduction, but until about 10 km inland it is still high, with typical cool-climate vegetation. The climate of the region is *Cfb* in the Köppen classification (Moreno 1961). The average annual temperature in São Francisco de Paula municipality, eastern Plateau of Rio Grande do Sul, is 14.5°C. The average maximum temperature is 20.9°C, absolute maximum is 34°C, average low temperature is 9.9°C, and absolute minimum is -6.5°C. Negative temperatures can occur between April and November. Frosts are frequent, and during six months the average low temperatures are 10°C or lower. During more intense winters, snow may also occur (Backes 1999).

Bogs play an important role as water reservoirs as they slowly release water to feed creeks, thereby exerting a regulatory action. Organic debris, especially pollen, spores and other palynomorphs, are preserved in the peat, allowing the study of the vegetation and climate of the last millennia (Colditz 1994; Spalding and Lorscheitter 2009; Leonhardt and Lorscheitter 2010).

For a long time, Southern Brazilian bogs have attracted the interest of researchers, including Ule (1899), who primarily studied bogs mainly in highlands of Santa Catarina state. According to Rambo (1949), perhaps there is no land more rewarding for botanical exploration in the whole of Rio Grande do Sul than the bogs of the eastern edge of the Plateau. Despite this, floristic surveys in these ecosystems have been rare in this State: Rambo (1949; 1956), Pfadenhauer and Boechat (1981) and Silva (2002). Rambo (1949) cited four species of angiosperms, one pteridophyte and one bryophyte for bogs. Rambo (1956) also reported 164 species of angiosperms in bogs of the Plateau of Rio Grande do Sul. A phytosociological study of the Banhado do Camisa bog in Cambará do Sul (Pfadenhauer and Boechat, 1981), revealed 91 species of angiosperms, four pteridophytes and nine bryophytes. For a bog at São José dos Ausentes, Silva (2002) listed 40 species of angiosperms, two pteridophytes and one bryophyte.

Our study focused on the Banhado Amarelo bog, on the eastern Plateau of Rio Grande do Sul (Fortes, 1959). For the first time in Southern Brazil highland bogs, our study listed macroscopic fungi, lichens, mat forming algae, bryophytes, pteridophytes, gymnosperms and angiosperms in order to provide an overview of this ecosystem and its biodiversity.

MATERIALS AND METHODS

Study site

The Banhado Amarelo bog (29°19' S, 50°08' W) is located in São Francisco de Paula municipality, eastern Plateau of the Rio Grande do Sul state. The bog is near the Serra das Pedras Brancas canyons at an altitude of 1003 m (Figure 1). Our study focused on the bog that is part of this wetland and that is 1130 m long and 400 m wide in its central portion. In this bog, the pH varies between 4 and 5. A long and sinuous Araucaria forest is found contiguous to the bog on the flat surfaces following along one of its sides. On the other side, the bog is interrupted by a slightly

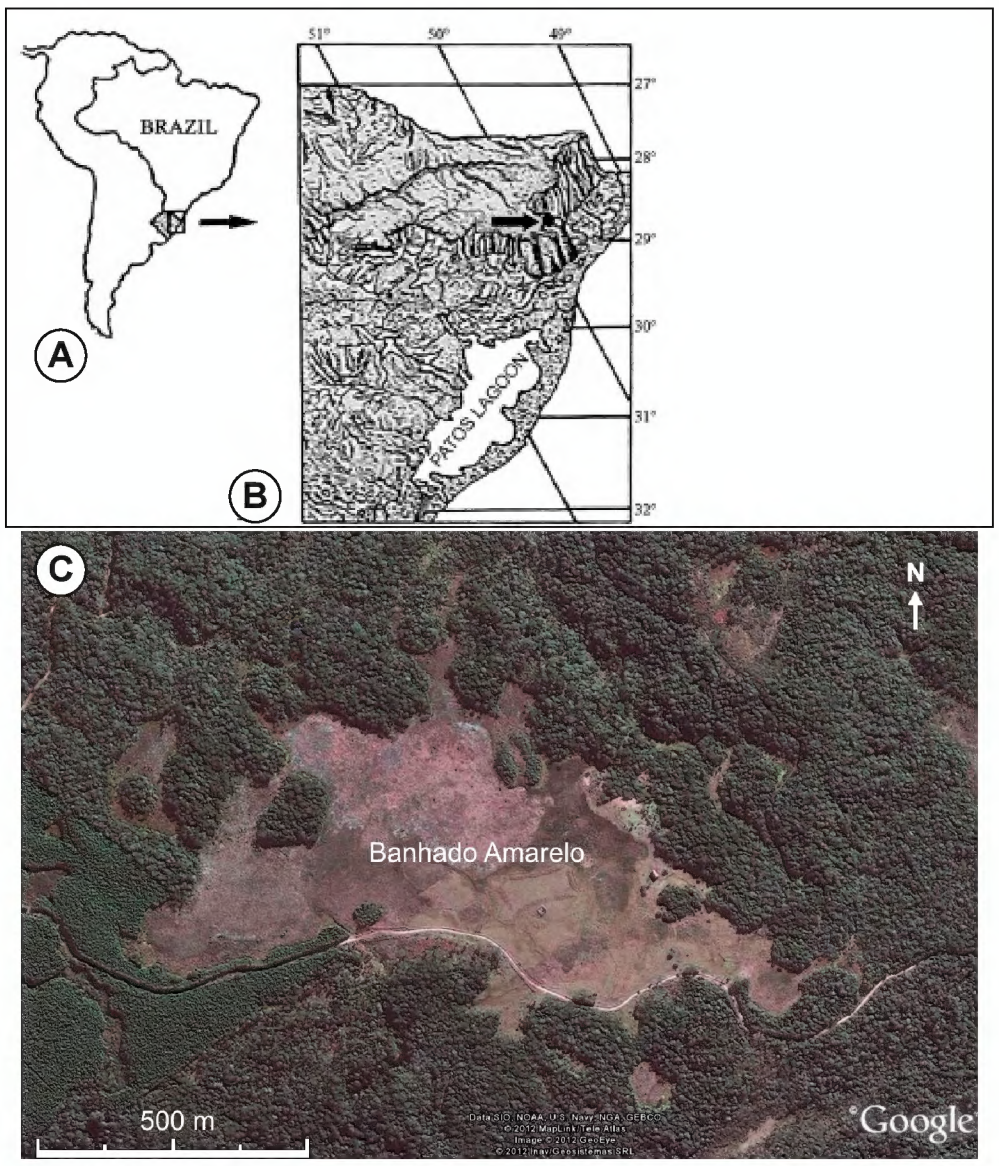

FIGURE 1. A. Map of South America showing Rio Grande do Sul in Southern Brazil; B. Banhado Amarelo location (arrow) on the eastern Plateau; C. Satellite image of the Banhado Amarelo bog (29°19' S, 50°08' W) and its access road. Proximal extremity (left), distal extremity (right).

elevated area, through which a narrow access road runs. Both the forest and the bog are very well preserved, in part due to their great geographic isolation from urban centers. The only influence of exotic species is from the extensive *Pinus* plantations that border part of the wetland and that dangerously threaten the entire ecosystem. Due to restrictive soil conditions – water accumulation, low oxygen level, poor nutrient supply and low pH – the adapted flora that has developed in the bog is characteristic of this ecosystem and independent, to a certain extent, of the regional climate. The slow and incomplete decomposition of plant residues due to the constant water logging in the soil and the subsequent absence of oxygen results in peat, a dark sediment that is rich in organic matter. *Sphagnum* species, the bog mosses, characterize this environment.

Data collection

The floristic survey was conducted for three years through monthly walks along transects running from the margin areas to the interior of the bog, including all types of phyto-physiognomies occurring within the bog. Voucher specimens were deposited in the ICN herbarium (herbarium of the Botany Department, Biosciences Institute, Universidade Federal do Rio Grande do Sul). Botanical identifications were carried out by consulting the ICN herbarium collection, specialized bibliography and various specialists. For families we followed CABI (2011) for fungi, ITIS (2011) for lichens, Bicudo and Menezes (2006) for algae, Gradstein and Costa (2003) for liverworts and hornworts, Tryon and Tryon (1982) for pteridophytes, Bold *et al.* (1987) for gimnosperms and APG III (2009) for angiosperms. We researched valid names in electronic databases of the World checklists: MOBOT (2011) for angiosperms and CABI (2011) and ITIS (2011) for other groups. Although the specialists could not identify most species of fungi and algae because of their incomplete characteristics, these were included as a not negligible part of the ecosystem.

For every species we indicated its mode of occurrence in the bog: 1. Distributed indistinctly in different areas; 2. Exclusive to or more concentrated in: 2.1. Shrub-dominion; 2.2. Herbaceous-dominion; 2.3. Margin contiguous with the Araucaria forest; 2.4. Margin alongside the access road; 2.5. Margin in the proximal extremity (beginning of access road); 2.6. Margin in the distal extremity (end of access road). Rare taxa, generally only collected once, are indicated with the letter "r".

The frequency of distinct taxonomic groups among themselves was determined and a general description of the flora of the main bog environments is presented. The number of taxa found in the bog was compared to those obtained in other floristic surveys of bogs of the eastern Plateau from Rio Grande do Sul.

RESULTS AND DISCUSSION

A total of 262 specific and infra-specific taxa were listed with their mode of occurrence in the bog (Table 1). The list includes two gymnosperms (1%), six macroscopic fungi (2%), 10 lichens (4%), 12 pteridophytes (5%), 21 mat forming algae (8%), 57 bryophytes (22%) and 154 angiosperms (58%), (Figure 2). Asteraceae, Cyperaceae and Poaceae accounted for 49% of the angiosperms and Asteraceae was the most represented family, corresponding to 23% of the angiosperms (Figure 3).

A general description of the flora of the main environments of the Banhado Amarelo bog is provided below.

Shrub-dominion (2.1)

From near the proximal extremity (beginning of access road) to the center of the bog, there is an extensive area covered by a dense community of *Androtrichum giganteum* (Kunth) H. Pfeiff., which promoted a discontinuous under layer of *Sphagnum recurvum* P. Beauvois due to space reduction and shade (Figure 4). Various shrubby Asteraceae were found in this area and are scattered over the ground, like *Eupatorium gaudichaudianum* DC., one of the most common species, *Symphyopappus compressus* (Gardner) B. L. Rob. and *Vernonia nitidula* Less.

Tall Poaceae species, including *Axonopus ramboi* G. A. Black, *Briza juergensii* Hack., *Festuca ampliflora* Döll, *Paspalum exaltatum* J. Presl and *Stipa sellowiana* Nees ex Trin. and Rupr. are also commonly found here. A small area of *Cortaderia selloana* (Schult. and Schult. f.) Asch. and Graebn. is evident near the *Araucaria* forest (Figure 5).

Aulonemia ulei (Hack.) McClure and L. B. Sm. is found scattered near the proximal extremity. A higher concentration of this species is found further on, in a location where a dense bamboo area is formed (Figure 6), first with well-defined lobed borders, which are interspersed with *Androtrichum giganteum* community, until *Aulonemia ulei* disappears in the middle of the bog. Lichens such as *Usnea elongata* Motika and *Hypotrachyna* cf. *laevigata* (Sm.) Hale are very common epiphytes on shrubs and bamboo in the area. The shade resulting from the *A. ulei* community and other tall plants, together

with the high humidity of the soil, led to the formation of microhabitats that favor the development of a large number of forest bryophytes, especially *Isopterygium tenerum* (Sw.) Mitt. and Lejeuneaceae and Jubulaceae species that live together at the humid bases of stems and sometimes extend to the soil.

Herbaceous-dominion (2.2)

From the middle of the bog to the distal extremity, *Sphagnum recurvum* greatly dominates (Figure 7), with a continuous and thick coverage on a soil that is wetter than that of the shrub-dominion. In the central zone, *S. recurvum* is frequently covered by a whitish layer of *Cladonia confusa* f. *confusa* R. Sant (Figure 8). Small dark patches of *Gloeothece* sp. also cover *S. recurvum* and harbor other algae, such as *Tribonema* sp., and liverworts, such as *Cephalozia crassifolia* (Lindb. and Gott.) Fulford, *Cephaloziella subpapillosa* Herzog and *Kurzia capilaris* (Sw.) Grolle.

Polytrichum juniperinum Will. ex Hedw. grows among *S. recurvum* and is joined by *Campylopus filifolius* (Hornsch.) Mitt., *Campylopus reflexisetus* (C. M.) Broth., *Isopterygium tenerum*, lichens such as *Cladonia didyma* (Fée) Vain. and basidiomycetes such as *Hygrocybe miniata* (Fr.) P. Kumm. and *Conocybe* sp.

Drosera communis A. St.-Hil. and *Lycopodiella caroliniana* (Linnaeus) Pichi-Sermolli are also found in this environment. The latter can spread in large areas and sometimes it is semi-covered by *S. recurvum* (Figure 10). Red portions of *Sphagnum capillifolium* (Ehrh.) Hedw.are also found. Puddles are commonly filled with filamentous algae, especially *Spirogyra* sp. 1 and *Tribonema* sp.

Agarista nummularia (Cham. and Schltdl.) G. Don, *Blechnum imperiale* H. Chr., *Eriocaulon gomphrenoides* Kunth, *Gaylussacia pseudogaultheria* Cham. and Schltdl., *Paepalanthus catharinae* Ruhland, *Utricularia praelonga* A. St.-Hil. and Girard, *Xyris regnelli* Nilsson and *X. teres* Alb. Nilsson are among the most common species in this area. *Achyrocline satureioides* (Lam.) DC. and *Saccharum asperum* (Nees) Steud. are dispersed throughout the habitat. In addition to these species with

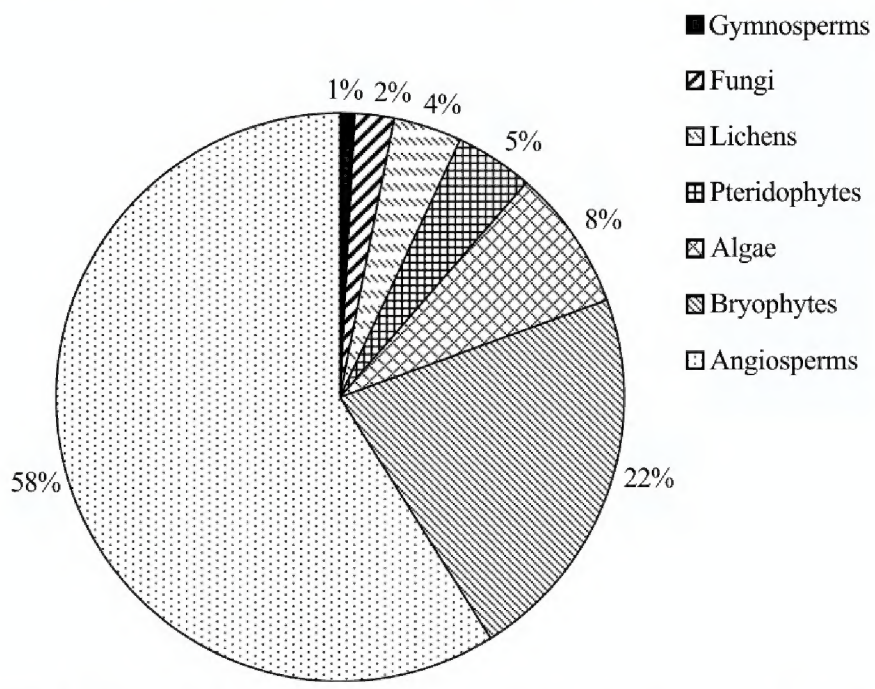

FIGURE 2. Percentage relationships among the taxonomic groups found at the Banhado Amarelo bog, São Francisco de Paula, Rio Grande do Sul, Southern Brazil.

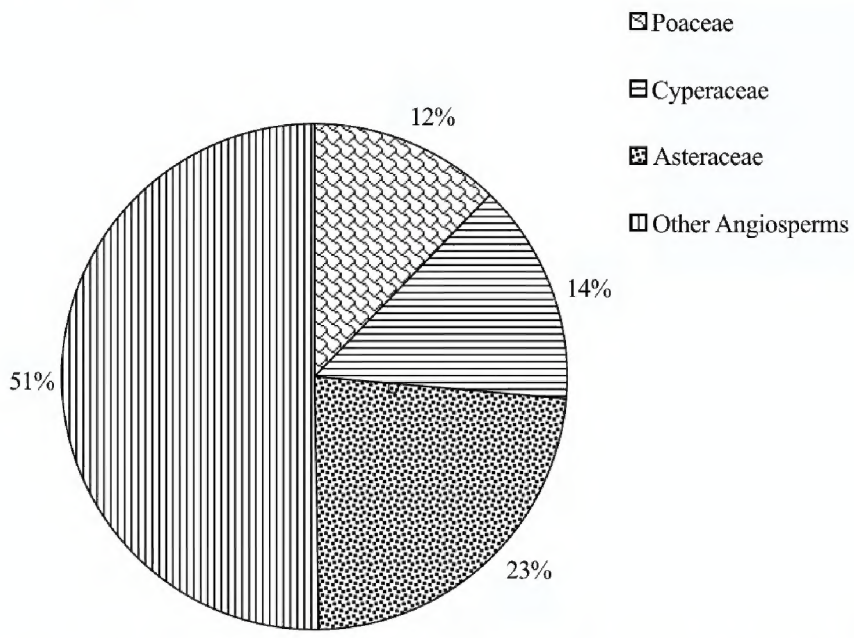

FIGURE 3. Percentage relationships among the principal families of the angiosperm species found in the Banhado Amarelo bog, São Francisco de Paula, Rio Grande do Sul, Southern Brazil.

FIGURE 4. Shrub-dominion. *Androtrichum giganteum*, *Eupatorium gaudichaudianum* and *Blechnum imperiale.*

FIGURE 5. Shrub-dominion. *Androtrichum giganteum*, *Baccharis milleflora*, and a small area of *Cortaderia selloana*.

FIGURE 6. Shrub-dominion. The area of higher concentration of *Aulonemia ulei* in the whole bog.

wide distributions, the area also has various patches of vegetation, such as a small bamboo grouping of *Aulonemia ulei*, a zone of *Rhynchospora brasiliensis* Boeck and other of *Danthonia montana* Döll (Figures 9 and 11). At the humid bases of stems of *Aulonemia ulei* bryophytes and lichens are found, although in lower quantities than those found in the larger bamboo thicket of the shrub-dominion zone. Near the distal extremity of the bog, there is a distinct zone that corresponded to a large concentration of *Senecio pulcher* Hook. and Arn. f. *pulcher* (Figure 12) and another zone densely populated with *Baccharis milleflora* DC. that clearly stands out in the landscape due to its dark green color (Figure 13).

Figure 7. Herbaceous-dominion. A continuous cover of *Sphagnum recurvum*, *Saccharum asperum* dispersed and a large area of *Blechnum imperiale*.

Figure 8. Herbaceous-dominion. *Cladonia confusa* f. *confusa* patch (whitish layer) and *Polytrichum juniperinum* covering part of *Sphagnum capillifolium* (red). *Agarista nummularia* forming the higher cover.

Figure 9. Herbaceous-dominion. Extensive zone of *Rhynchospora brasiliensis* covering *Sphagnum recurvum*. Some white small patches of *Cladonia confusa* f. *confusa* on the first plane.

Figure 10. Herbaceous-dominion. A continuous layer of *Sphagnum recurvum* partially covered by white patches of *Cladonia confusa* f. *confusa* and an area of *Lycopodiella caroliniana*, with erect strobili, semi-covered by *S. recurvum*.

Figure 11. Herbaceous-dominion. Extensive zone of *Danthonia montana* and *Blechnum imperiale* scattered in the area. Two *Eriocaulon gomphrenoides* plants on the first plane.

Figure 12. Herbaceous-dominion. The distinct zone of *Senecio pulcher* f. *pulcher*, with many plants of *Eriocaulon reitzii* and *Eriochrysis holcoides*.

Figure 13. Herbaceous-dominion. Densely populated zone of *Baccharis milleflora*.

Margin zones

Along the margin contiguous to the *Araucaria* forest (2.3), the bog was colonized by some forest species, such as *Araucaria angustifolia* (Bertol.) Kuntze, *Dicksonia sellowiana* Hook., *Drimys brasiliensis* Miers, *Fuchsia regia* (Vell.) Munz, *Myrceugenia glaucescens* (Cambess.) D. Legrand and Kausel, *Podocarpus lambertii* Klotzsch ex Endl., *Rapanea gardneriana* (A. DC.) Mez, and *Siphoneugena reitzii* D. Legrand. Among them, *D. brasiliensis* and *P. lambertii* can advance even more, and some specimens are found in more central areas of the shrub-domination zone.

The other margins of the bog – the margin alongside the access road (2.4), the proximal (2.5) and distal (2.6) extremity – had diverse flora, and some swamp species are exclusively found in these zones.

The margin alongside the access road (2.4) is very humid, and its herbaceous flora includes species common to other zones and exclusive species, such as *Achyrocline alata* DC., *Rhynchospora corymbosa* (L.) Britton and *Xyris tenella* Kunth. In a small shallow stream, which flows out of the bog, there are dark patches of *Batrachospermum* sp. and mucilaginous colonies of *Chlorococcum* cf. *infusionum* (Schrank) Meneghini attached to submerged rocks (Figure 14).

The margin in the proximal extremity (2.5) is rich in species and has taxa such as *Axonopus compressus* (Sw.) P. Beauv., *Baccharis deblei* An. S. de Oliveira and Marchiori, *Brachystele ulaei* (Cogn.) Schltr., *Cyperus hermaphroditus* (Jacq.) Standl., *Emmeorhiza umbellata* (Spreng.) K. Schum., *Paspalum pumilum* Nees, *Ranunculus bonariensis* Poir. and *Scirpus sellowianus* (Kunth) Griseb., which are only found in this portion.

On the distal extremity margin (2.6) another narrow and shallow stream presents submersed algae, such as *Fragilaria javanica* Hustedt (in conspicuous macroscopic colonies) and species of *Batrachospermum*, *Bulbochaete*, *Microspora* and *Spirogyra* sp. 1. Another submerged plant is *Sphagnum cuspidatum* Ehrh. ex Hoffm. var. *serrulatum* (Schlieph.) Schlieph.. Along the stream margin the soggy ground enables the existence of some angiosperms of its own, such as *Paepalanthus caldensis* Malme, R*anunculus* cf. *parviflorus* L. and *Utricularia gibba* L.

The total number of collected angiosperm species (154) corresponds to 94% of the angiosperm species listed by Rambo (1956) for bogs of Rio Grande do Sul highlands. The number of Angiosperms of Banhado Amarelo bog is also very high when compared to the other bogs of Rio Grande do Sul: 69% higher than the total number of angiosperms listed by Pfadenhauer and Boechat (1981) for the Banhado do Camisa bog (Cambará do Sul) and four times higher than the total number of angiosperms reported by Silva (2002) in a bog of São José dos Ausentes.

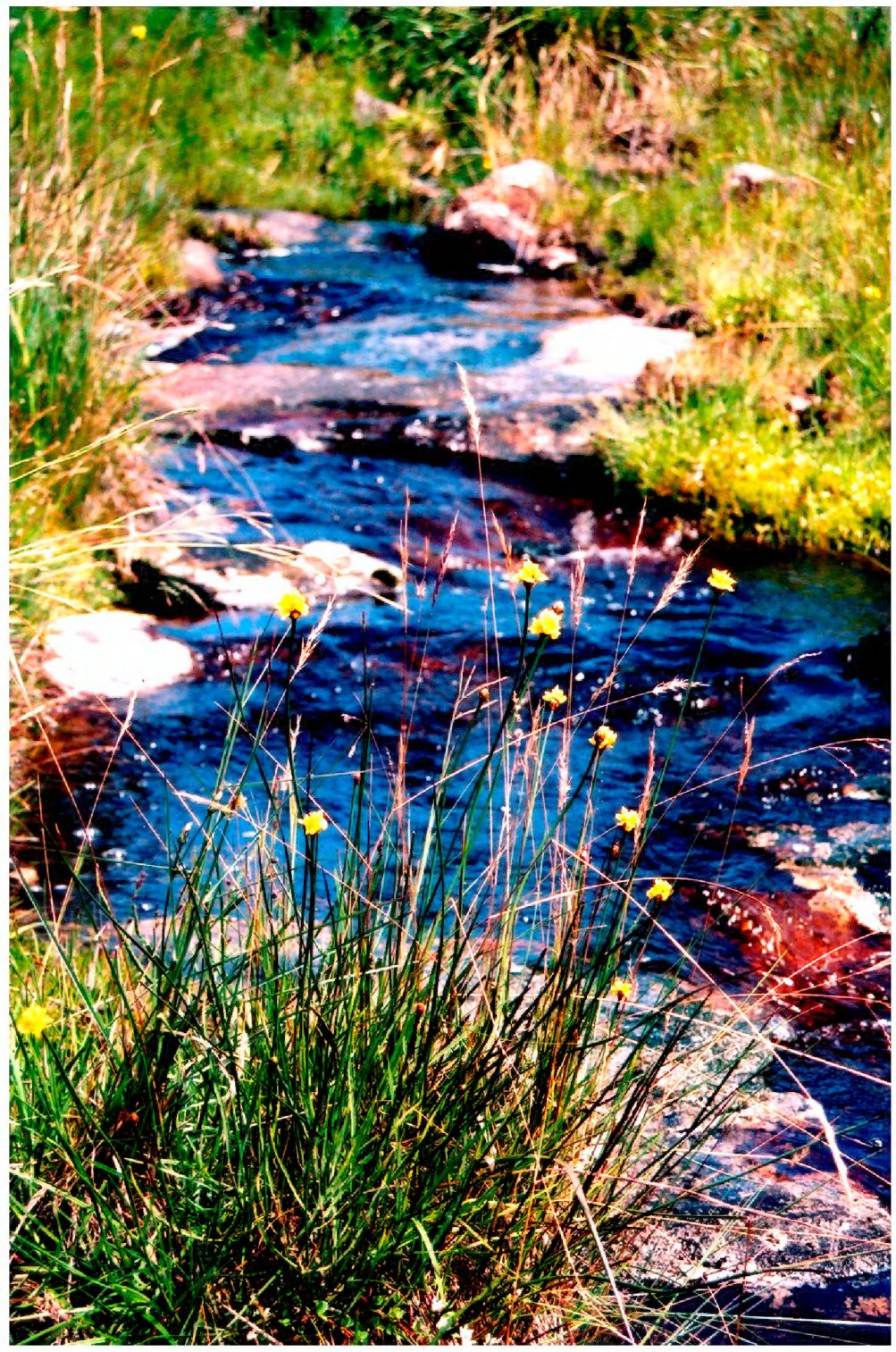

Figure 14. Small shallow stream, which flows out of the bog at margin alongside the access road, algae species of *Batrachospermum* and *Chlorococcum*, attached to submerged rocks. *Xyris teres* on the first plane.

This taxonomic study of the bog showed a well-preserved native flora with a large number of species. Two new species from bogs, *Rumohra turficola* Senna and *Baccharis sphagnophila* Schneid and Heiden, were indicated to this bog (Senna 2005; Schneider *et al.* 2011).

The high floristic diversity encountered indicates the relevance of subtropical bog ecosystems in Southern Brazil highlands and the need to preserve them as important genetic resources.

Table 1. Fungi, lichens and plants in the Banhado Amarelo bog, São Francisco de Paula, Rio Grande do Sul, Southern Brazil and their occurrence. 1. Distributed indistinctly in different areas of the bog; 2. Exclusive to or more concentrated in: 2.1. Shrub-dominion; 2.2. Herbaceous-dominion; 2.3. Margin contiguous to the Araucaria forest; 2.4. Margin alongside the access road; 2.5. Margin in the proximal extremity (beginning of access road); 2.6. Margin in the distal extremity (end of access road). (r) rare.

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
FUNGI		
BOLBITIACEAE		
Conocybe sp.	2.2	172672
HYGROPHORACEAE		
Hygrocybe miniata (Fr.) P. Kumm.	2.2	172673
MARASMIACEAE		
Marasmiellus sp.	2.1 r	172674
STROPHARIACEAE		
Agrocybe sp.	2.2	172675
SUILLACEAE		
Suillus sp.	2.3 r	172676
TRICHOLOMATACEAE		
Collybia sp.	2.1 r	172677
LICHENS		
CLADONIACEAE		
Cladonia cf. *chlorophaea* (Flörke *ex* Sommerf.) Spreng.	2.2	172678
Cladonia confusa f. *confusa* R. Sant.	2.2	172679
Cladonia didyma (Fée) Vain.	2.2	172680
Cladonia furfuracea Vain.	2.2	172681
Cladonia macilentoides Ahti and Fleig	2.1 r	172682
COLLEMATACEAE		
Leptogium cyanescens (Pers.) Körb.	2.1 r	172683
CORTICIACEAE		
Dictyonema glabratum (Spreng.) D. Hawksw.	2.3	172684
PARMELIACEAE		
Hypotrachyna cf. *laevigata* (Sm.) Hale	2.1	172685
Usnea elongata Motika	1	172686
PHYSCIACEAE		
Heterodermia leucomelaena (L.) Poelt	2.1 r	172687
ALGAE		
BATRACHOSPERMACEAE		
Batrachospermum sp.	2.4; 2.6	172688
CHLOROCOCCACEAE		
Chlorococcum cf *infusionum* (Schrank) Meneghini	2.4; 2.6 r	172689
DESMIDIACEAE		
Desmidium laticeps Nordstedt var. *quadrangulare* Nordstedt	2.2 r	172690
Hyalotheca dissiliens (Smith) Brébisson var. *tatrica* Raciborski	2.2 r	172691
FRAGILARIACEAE		
Fragilaria javanica Hustedt	2.6 r	172692
MASTIGOCLADACEAE		
Hapalosiphon sp.	2.2 r	172693
MICROSPORACEAE		
Microspora sp.	2.6 r	172694
NOSTOCACEAE		
Anabaena sp.	1 r	172695
Nostoc sp.	2.1 r	172696
OEDOGONIACEAE		
Bulbochaete sp.	2.6 r	172697
Oedogonium sp.	2.2 r	172698
OSCILLATORIACEAE		
Lyngbya sp.	2.2 r	172699

Table 1. ***Continued.***

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
Oscillatoria sp.	2.1 r	172700
PHORMIDIACEAE		
Microcoleus sp.	2.2 r	172701
STIGONEMATACEAE		
Stigonema sp.	2.1 r	172702
SYNECHOCOCCACEAE		
Gloeothece sp.	2.2	172703
TRENTEPOHLIACEAE		
Trentepohlia sp.	2.1	172704
TRIBONEMATACEAE		
Tribonema sp.	2.2	172705
ZYGNEMACEAE		
Mougeotia sp.	2.2 r	172706
Spirogyra sp. 1	2.2; 2.6	172707
Spirogyra sp. 2	2.1 r	172708
BRYOPHYTES		
LIVERWORTS		
ANEURACEAE		
Riccardia cataractarum (Spruce) Hell	2.1; 2.2	172709
CALYPOGEIACEAE		
Calypogeia subintegra (Gottsche, Lindenberg and Nees) Bischler	1	172710
CEPHALOZIACEAE		
Cephalozia crassifolia (Lindb. and Gott.) Fulford	2.2	172711
CEPHALOZIELLACEAE		
Cephaloziella granatesis (J. B. Jack) Fulford	2.1 r	172712
Cephaloziella subpapillosa Herzog	2.2	172713
GEOCALYCACEAE		
Lophocolea martiana Nees	2.1 r	172714
Lophocolea muricata (Lehm.) Nees	2.1	172715
JUBULACEAE		
Frullania arecae (Spreng.) Gott.	2.1 r	172716
Frullania beyrichiana (Lehm. and Lindenb.) Lehm. and Lindenb.	2.1	172717
Frullania brasiliensis Raddi	2.1	172718
Frullania caulisequa (Nees) Nees	2.1 r	172719
Frullania kunzei (Lehm. and Lindenb.) Lehm and Lindenb.	2.1 r	172720
Frullania lindenbergii Lehmann	2.1 r	172721
Frullania setigera Stph.	2.1 r	172722
LEJEUNEACEAE		
Anoplolejeunea conferta (Meiss.) Evans	1	172723
Aphanolejeunea sp.	2.1 r	172724
Brachiolejeunea laxifolia (Tayl.) Schiffn.	2.1	172725
Cololejeunea minutissima (Sm.) Schiffn subp. *minutissima*	2.1	172726
Colura calyptrifolia (Hook.) Dumort.	2.1	172727
Colura tortifolia (Nees and Mont.) Steph.	2.1 r	172728
Drepanolejeunea araucariae Steph.	1	172729
Harpalejeunea stricta (Lindenb. and Gottsche) Steph.	2.1 r	172730
Lejeunea sp. 1	1	172731
Lejeunea sp. 2	2.1	172732
Lejeunea sp. 3	2.1 r	172733
Leucolejeunea xanthocarpa (Lehm. and Lindenb.) Evs.	2.1	172734
Microlejeunea bullata (Tayl.) Steph.	2.1	172735
Omphalanthus filiformis (Sw.) Nees	2.1	172736
LEPIDOZIACEAE		
Kurzia capilaris (Sw.) Grolle	2.2	172737

TABLE 1. ***CONTINUED.***

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
Kurzia flagellifera (Steph.) Grolle	2.1	172738
Telaranea nematodes (Gottsche ex Austin) M. A. Howe	1	172739
METZGERIACEAE		
Metzgeria albinea Spruce	2.1	172740
Metzgeria dichotoma (Sw.) Nees	2.1 r	172741
Metzgeria furcata (L.) Dumort.	2.1	172742
Metzgeria myriopoda Lindb.	2.1 r	172743
PALLAVICINIACEAE		
Symphyogyna aspera Steph.	2.1 r	172744
PLAGIOCHILACEAE		
Plagiochila bifaria (Sw.) Lindenb.	2.1	172745
Plagiochila corrugata (Nees) Nees and Mont.	2.1 r	172746
RADULACEAE		
Radula kegelii Gottsche ex Steph.	2.1 r	172747
Radula sinuata Gottsche ex Steph.	2.1	172748
Radula tectiloba Steph.	2.1 r	172749
HORNWORTS		
ANTHOCEROTACEAE		
Phaeoceros laevis (L.) Prosk.	2.2	172750
MOSSES		
BRYACEAE		
Bryum densifolium Brid.	2.2 r	172751
Rhodobryum beyrichianum (Hornsch.) Müll. Hal.	2.1; 2.3	172752
CALYMPERACEAE		
Syrrhopodon prolifer Schwägr. var. prolifer	2r	172753
DALTONIACEAE		
Daltonia longifolia Taylor	2.1	172754
DICRANACEAE		
Campylopus filifolius (Hornsch.) Mitt.	2.2	172755
Campylopus reflexisetus (C. M.) Broth.	2.2	172756
FISSIDENTACEAE		
Fissidens serratus Müll. Hal.	2.1 r	172757
HOOKERIACEAE		
Cyclodictyon albicans (Hedw.) Kunze	2.1 r	172758
HYPNACEAE		
Isopterygium tenerum (Sw.) Mitt.	1	172759
PHYLLOGONIACEAE		
Phyllogonium viride Brid.	2.1 r	172760
POLYTRICHACEAE		
Polytrichum juniperinum Will. and Hedw.	2.2	172761
RHIZOGONIACEAE		
Pyrrhobryum spiniforme (Hedw.) Mitt.	2.1 r	172762
SPHAGNACEAE		
Sphagnum capillifolium (Ehrh.) Hedw.	2.2	172763
Sphagnum cuspidatum Ehrh. ex Hoffm. var. *serrulatum* (Schlieph.) Schlieph.	2.6	172764
Sphagnum recurvum P. Beauvois	2.2	172765
PTERIDOPHYTES		
BLECHNACEAE		
Blechnum imperiale H. Chr.	2.2	172766
Blechnum serrulatum Richard	2.1	172767
DICKSONIACEAE		
Dicksonia sellowiana Hook.	2.3 r	172768

TABLE 1. ***CONTINUED.***

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
DRYOPTERIDACEAE		
Rumohra turficola Senna	2.1	172769
HYMENOPHYLLACEAE		
Hymenophyllum sp.	2.1 r	172770
LYCOPODIACEAE		
Lycopodiella allopecuroides (L.) Cranfill	2.5 r	172771
Lycopodiella caroliniana (Linnaeus) Pichi-Sermolli	2.2	172772
Lycopodium clavatum Linnaeus	1 r	172773
OSMUNDACEAE		
Osmunda cinnamomea L.	2.3	172774
Osmunda regalis L.	2.3	172775
SELAGINELLACEAE		
Selaginella marginata (Willdenow) Spring	1	172776
THELYPTERIDACEAE		
Thelypteris rivularioides (Fée) Abbiatti	1	172777
GYMNOSPERMS		
ARAUCARIACEAE		
Araucaria angustifolia (Bertol.) Kuntze	2.3	172778
PODOCARPACEAE		
Podocarpus lambertii Klotzsch ex Endl.	2.3	172779
ANGIOSPERMS		
DICOTYLEDONS		
APIACEAE		
Eryngium pandanifolium Cham. and Schltdl.	2.1	172780
Eryngium urbanianum H. Wolff	2.5	172781
APOCYNACEAE		
Orthosia scoparia (Nutt.) Liede and Meve	2.3 r	172782
ARALIACEAE		
Hydrocotyle pusilla A. Rich.	2.1 r	172783
Hydrocotyle quinqueloba Ruiz and Pav.	2.3 r	172784
ASTERACEAE		
Achyrocline alata DC.	2.4	172785
Achyrocline satureioides (Lam.) DC.	2.2	172786
Baccharis brachylaenoides DC.	2.1	172787
Baccharis deblei An. S. de Oliveira and Marchiori	2.5	172788
Baccharis leucopappa DC.	1	172789
Baccharis megapotamica Spreng.	1	172790
Baccharis microcephala Baker	2.2	172791
Baccharis milleflora DC.	2.2	172792
Baccharis ramboi G. Heiden and L. Macias	1	172793
Baccharis sphagnophila Schneid and Heiden	1	172794
Baccharis uncinella DC.	1 r	172795
Chaptalia graminifolia Dusén	2.2	172796
Conyza floribunda Kunth	1 r	172797
Erechtites valerianifolius (Link ex Spreng.) DC.	1	172798
Eupatorium betoniciiforme (DC.) Baker var. *betoniciiforme*	1	172799
Eupatorium betoniciiforme (DC.) Baker var. *hastatum* Baker	1	172800
Eupatorium bupleurifolium DC. var. *bupleurifolium*	1	172801
Eupatorium gaudichaudianum DC.	2.1	172802
Eupatorium purpurascens Sch. Bip. ex Baker	2.3 r	172803
Eupatorium serratum Spreng.	1	172804
Eupatorium tweedieanum Hook. and Arn.	1 r	172805
Holocheilus illustris Cabrera	2.1	172806
Hypochaeris lutea Britton	1	172807

TABLE 1. ***CONTINUED.***

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
Jaegeria hirta (Lag.) Less	2.5 r	172808
Leptostelma catharinense (Cabrera) A. Teles and Sobral	2.3	172809
Mikania orleansensis Hieron.	2.3 r	172810
Pentacalia desiderabilis (Velloso) Cuatrec.	2.3 r	172811
Senecio conyzaefolius Baker	2.2	172812
Senecio juergensii Mattf	1	172813
Senecio promatensis Matzenbacher	1	172814
Senecio pulcher Hook. and Arn. f. *pulcher*	2.2	172815
Senecio pulcher Hook. and Arn. f. *albiflorus* Matzenbacher	1	172816
Symphyopappus compressus (Gardner) B. L. Rob.	2.1	172817
Trixis lessingii DC.	1	172818
Vernonia discolor (Spreng.) Less.	2.3	172819
Vernonia nitidula Less.	2.1	172820
CAMPANULACEAE		
Pratia hederacea (Cham.) G. Don	2.4 r	172821
CAPRIFOLIACEAE		
Valeriana salicariifolia Vahl	2.3 r	172822
CARYOPHYLLACEAE		
Cerastium commersonianum DC.	2.2 r	172823
Cerastium rivulare Cambess.	2.3 r	172824
CUNONIACEAE		
Weinmannia cf. *paulliniifolia* Pohl	2.3	172825
DROSERACEAE		
Drosera communis A.St.-Hil.	2.2	172826
ERICACEAE		
Agarista niederleinii (Sleumer) Judd	2.1	172827
Agarista nummularia (Cham. and Schltdl.) G. Don	2.2	172828
Gaylussacia pseudogaultheria Cham. and Schltdl.	2.2	172829
EUPHORBIACEAE		
Croton lanatus Lam.	2.1	172830
Croton myrianthus Müll. Arg.	1 r	172831
HYPERICACEAE		
Sarothra brasiliensis (Choisy) Y. Kimura	2.5	172832
LENTIBULARIACEAE		
Utricularia gibba L.	2.6 r	172833
Utricularia praelonga A. St.-Hil. and Girard	2.2	172834
Utricularia tridentata Sylvén	2.2	172835
LYTHRACEAE		
Cuphea cf. *urbaniana* f. *uleana* Koehne	2.1	172836
MELASTOMATACEAE		
Leandra humilis (Cogn.) Wurdack	1	172837
Miconia hyemalis Naudin	2.3	172838
Rhynchanthera brachyrhyncha Cham.	1	172839
Tibouchina cerastifolia (Naudin) Cogn.	1	172840
Tibouchina clinopodifolia (DC) Cogn.	2.3 r	172841
Tibouchina gracilis (Bonpl.) Cogn.	1	172842
MYRTACEAE		
Myrceugenia glaucescens (Cambess.) D. Legrand and Kausel	2.3 r	172843
Siphoneugena reitzii D. Legrand	2.3	172844
ONAGRACEAE		
Fuchsia regia (Vell.) Munz	2.3	172845
Ludwigia longifolia (DC.) H. Hara	2.3	172846
OXALIDACEAE		
Oxalis sp.	2.5	172847
Oxalis cf. *bipartita* A. St.-Hil.	2.3 r	172848

Table 1. ***Continued.***

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
PASSIFLORACEAE		
Passiflora caerulea L.	2.1 r	172849
PLANTAGINACEAE		
Plantago australis Lam.	2.3 r	172850
POLYGALACEAE		
Polygala brasiliensis L.	1	172851
Polygala linoides Poir.	2.2	172852
PRIMULACEAE		
Anagallis filiformis Cham. and Schltdl.	2.4	172853
Rapanea gardneriana (A. DC.) Mez	2.3	172854
RANUNCULACEAE		
Ranunculus bonariensis Poir.	2.5 r	172855
R*anunculus* cf. *parviflorus* L.	2.6 r	172856
ROSACEAE		
Rubus sp.	2.1 r	172857
RUBIACEAE		
Coccocypselum reitzii L. B. Sm. and Downs	1	172858
Emmeorhiza umbellata (Spreng.) K. Schum.	2.5 r	172859
Galium equisetoides (Cham. and Schltdl.) Standl.	2.1	172860
Galium hypocarpium (L.) Endl. ex Griseb.	2.1 r	172861
Galium nigroramosum (Ehrend.) Dempster	2.3	172862
Oldenlandia salzmannii (DC.) Benth. and Hook. f. ex B.D. Jacks.	2.4; 2.5	172863
Relbunium humile (Cham. and Schltdl.) K. Schum.	2.2 r	172864
SCROPHULARIACEAE		
Buddleja elegans Cham. and Schltdl.	2.1	172865
SOLANACEAE		
Solanum laxum Spreng.	2.1	172866
Solanum pseudocapsicum L.	2.3	172867
VERBENACEAE		
Verbena alata Otto ex Sweet	2.3	172868
WINTERACEAE		
Drimys brasiliensis Miers	2.3	172869
MONOCOTYLEDONS		
ALSTROEMERIACEAE		
Alstroemeria isabellana Herb.	1 r	172870
BURMANNIACEAE		
Apteria aphylla (Nutt.) Barnhart ex Small	2.1 r	172871
CYPERACEAE		
Androtrichum giganteum (Kunth) H. Pfeiff.	2.1	172872
Carex longii Mack. subsp. *meridionalis* (Kük.) Luceño and M. V. Alves	1 r	172873
Cyperus haspan L.	1	172874
Cyperus hermaphroditus (Jacq.) Standl.	2.5 r	172875
Cyperus intricatus Schrad. ex Schult.	2.2 r	172876
Cyperus pohlii (Nees) Steud.	2.3 r	172877
Eleocharis bonariensis Nees	2.3 r	172878
Eleocharis kleinii Barros	2.2	172879
Eleocharis maculosa (Vahl) Roem. and Schult.	2.3; 2.4 r	172880
Eleocharis squamigera Svenson	2.3 r	172881
Eleocharis viridans Kük. ex Osten	2.3	172882
Pycreus niger (Ruiz & Pav.) Cufod.	1r	172883
Rhynchospora cf. *barrosiana* Guagl.	1	172884
Rhynchospora brasiliensis Boeck.	2.2	172885
Rhynchospora corymbosa (L.) Britton	2.4 r	172886
Rhynchospora glaziovii Boecki	2.3 r	172887

Table 1. ***Continued.***

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
Rhynchospora gollmeri Boeck.	1 r	172888
Rhynchospora hieronymii Boeck.	1	172889
Rhynchospora marisculus Lindl. ex Nees	2.2 r	172890
Rhynchospora cf. *polyantha* Steud.	2.3 r	172891
Scirpus sellowianus (Kunth) Griseb.	2.5 r	172892
Scleria balansae Maury	2.2 r	172893
ERIOCAULACEAE		
Eriocaulon gomphrenoides Kunth	2.2	172894
Eriocaulon reitzii Moldenke and L. B. Smith	2.2	172895
Paepalanthus caldensis Malme	2.6 r	172896
Paepalanthus catharinae Ruhland	2.2	172897
Syngonanthus caulescens (Poir.) Ruhland.	2.4; 2.6	172898
HYPOXIDACEAE		
Hypoxis decumbens L.	2.3 r	172899
IRIDACEAE		
Sisyrinchium cf. *luzula* Klotzsch ex Klatt	1	172900
Sisyrinchium cf. *vaginatum* Spreng	2.2	172901
JUNCACEAE		
Juncus brasiliensis Breistr.	2.2 r	172902
Juncus effusus L.	2.3	172903
Juncus microcephalus Kunth	1	172904
Juncus scirpoides Lam.	2.3	172905
Luzula ulei Buchenau	2.2 r	172906
ORCHIDACEAE		
Brachystele ulaei (Cogn.) Schltr.	2.5 r	172907
Cyclopogon apricus (Lindl.) Schltr.	2.2 r	172908
Habenaria montevidensis Spreng. var. *parviflora* (Lindl.) Pabst	2.4	172909
Habenaria rupicola Barb. Rodr.	2.4	172910
POACEAE		
Andropogon lateralis Nees	2.2 r	172911
Andropogon macrothrix Trin.	2.1	172912
Aulonemia ulei (Hack.) McClure and L.B. Sm.	1	172913
Axonopus compressus (Sw.) P. Beauv.	2.5	172914
Axonopus ramboi G. A. Black	2.1	172915
Briza juergensii Hack.	1	172916
Calamagrostis longearistata (Wedd.) Hack. ex Sodiro	1	172917
Cortaderia selloana (Schult. and Schult. f.) Asch. and Graebn.	2.1	172918
Danthonia montana Döll	2.2	172919
Dichanthelium sabulorum (Lam.) Gould and C. A. Clark var. *polycladum* (Ekman) Zuloaga	1	172920
Eriochrysis holcoides (Nees) Kuhlm.	1	172921
Festuca ampliflora Döll	1	172922
Leersia hexandra Sw.	1	172923
Paspalum exaltatum J. Presl	2.1	172924
Paspalum juergensii Hack.	2.3 r	172925
Paspalum polyphyllum Nees ex Trin.	2.2	172926
Paspalum pumilum Nees	2.5 r	172927
Saccharum asperum (Nees) Steud.	2.2	172928
Stipa sellowiana Nees ex Trin. and Rupr.	1	172929
XYRIDACEAE		
Xyris jupicai Rich.	2.2	172930
Xyris regnelli Nilsson	2.2	172931
Xyris tenella Kunth	2.4 r	172932
Xyris teres Nilsson	2.2	172933

Acknowledgments: The authors are grateful to Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for the financial aid and scholarships received. Our many thanks to the following researchers for taxonomic contributions: Ana Claudia Araújo, Ângelo Alberto Schneider, Carlos E. M. Bicudo, Claudia Bove, Hilda Maria Longhi Wagner, Inês Cordeiro, Lilian Eggers, Lilian Mentz, Luiza Kinoshita, Marcos Sobral, Maria Angélica Kieling-Rubio, Maria das Graças Lapa Wanderley, Maria Regina Barbosa, Marcos Sobral, Nelson Ivo Matzenbacher, Olga Yano, Paulo Cezar Baleeiro Souza, Paulo Günter Windisch, Paulo Sano, Sionara Eliasaro, Rafael Trevisan, Renato Goldenberg, Rodrigo Singer, Vera Regina Werner. We are grateful to Arnildo Pott and to the anonymous reviewer for their helpful comments.

Literature Cited

Backes, A. 1999. Condicionamento climático e distribuição geográfica de *Araucaria angustifolia* (Bertol.) Kuntze no Brasil – II. *Pesquisas – Botânica* 49: 31-51.

Backes, A., A.V. Fernandes and D.J. Zeni. 2000. Produção de folhedo em uma floresta com *Araucaria angustifolia* no sul do Brasil. *Pesquisas – Botânica* 50: 97- 117.

Bicudo, C.E.M. and M. Menezes. 2006. *Gêneros de algas de águas continentais do Brasil*. São Carlos: RiMa Editora. 489 p.

Bold, H.C., C.J.Alexopoulos and T. Delevoryas. 1987. *Morphology of Plants and Fungi.* New York: Harper & Row Publishers. 912 p.

CABI – Bioscience Databases. The Dictionary of the fungi. Eletronic Database accessible at *http://www.speciesfungorum.org*. Captured on 05 May 2011.

Colditz, G. 1994. Auen, Moore, Feuchtwiesen. Basel: Birkhäuser. 200 p.

Fortes, A.B. 1959. *Geografia Física do Rio Grande do Sul*. Porto Alegre: Livraria do Globo. 393 p.

Grandstein, S.R. and D.P. Costa. 2003 The hepaticae and anthocerotae of Brazil. *Memoirs of the New York Botanical Garden* 87: 1-317.

IBGE. 1986. Vegetação. As regiões fitoecológicas, sua natureza e seus recursos econômicos. Estudo fitogeográfico. In *Projeto Radambrasil. Levantamento de recursos naturais*, Rio de Janeiro: IBGE, v. 33.

ITIS. 2011. *Integrated Taxonomic Information System*. Eletronic Database accessible at *http://www.species2000.org. Captured on 09 May 2011.*

Leonhardt, A. and M.L. Lorscheitter. 2010. The last 25,000 years in the Eastern Plateau of Southern Brazil according to Alpes de São Francisco record. *Journal of South American Earth Sciences* 29: 454-463.

MOBOT - Missouri Botanical Gardens. *Tropicos org*. Eletronic Database accessible at http://www.tropicos. org. Captured on 18 May 2011.

Moreno, J.A. 1961. *Clima do Rio Grande do Sul*. Porto Alegre: Secretaria da Agricultura do Rio Grande do Sul. 42 p.

Nimer, E. 1989. *Climatologia do Brasil*.2ª ed., Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística. 421 p.

Pfadenhauer, J. and S. Castro Boechat.1981. Vegetation und Ökologie eines *Sphagnum*-Moores in Südbrasilien. *Vegetatio* 44: 177-187.

Rambo, B. 1949. A flora de Cambará. *Anais Botânicos do Herbário Barbosa Rodrigues* 1: 111-135.

Rambo, B. 1956. A flora fanerogâmica dos Aparados Riograndenses. Sellowia – *Anais Botânicos do Herbário Barbosa Rodrigues* 7: 235-298.

Schneider, A.A., G. Heiden and I.I. Boldrini. 2011. *Baccharis sphagnophila*, a new species of *Baccharis* sect. *Caulopterae* (Compositae: Astereae) from the highlands of Southern Brazil. *Kew Bulletin* 66: 1-3.

Senna, R.M. 2005. Uma nova espécie de *Rumohra* Raddi (Dryopteridaceae Pteridophyta) do Rio Grande do Sul, Brasil. *Iheringia Sér. Bot.* 60 (2): 253-258.

Silva, L.N.M. 2002. *Estrutura de uma turfeira de altitude no município de São José dos Ausentes (RS-Brasil)*. Unpublished Masters Dissertation. Porto Alegre: Universidade Federal do Rio Grande do Sul. 98 p.

Spalding, B.B.C. and M.L. Lorscheitter. 2009. Palinologia de sedimentos da turfeira do Banhado Amarelo, São Francisco de Paula, Rio Grande do Sul, Brasil. Fungos e criptógamas. *Hoehnea*. 36(2): 219-232.

Tryon, R.M. and A.F. Tryon. 1982. *Ferns and allied plants with special reference to Tropical America.* New York: Springer-Verlag. 857 p.

Ule, E. 1899. Die Verbreitung der Torfmoose und Moore in Brasilien. Botanische Jahrbüchern Für Systematik, *Pflanzengeschichte und Pflanzengeographie* 27 (1-2): 238-258.

Received: December 2011
Accepted: March 2012
Published online: May 2012
Editorial responsibility: Frederico Augusto Guimarães Guilherme